December and may extend into May if late storms develop. (FEIR, Vol. II, p. 4.7-3.) In dry years, upstream migration can be impeded by low flows at critical locations (e.g., riffles). (*Ibid.*) Adult steelhead require deep pools as resting areas and refuges from high flows and water temperatures. (CT-12, pp. 13-14.)

After migration, anadromous steelhead spawn in riffles and runs, (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, pp. 4-5; MU-224, p. 3), laying eggs in nests (redd) of gravels from 0.5 to 3-inch in diameter, (MU-224, p. 3). Spawning success, a factor in the production of young-of-the-year steelhead, depends on the quality of spawning conditions and ease of spawning access to suitable spawning habitat. (MU-224, p. 3.) The nests require gravel free of silt and sand for spawning. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-16.) If fine sediments accumulate within or over redds, they can interfere with water exchange and adversely affect eggs and newly-hatched fry (alevins). (*Id.*, p. 2-56.) The eggs and alevins buried in the gravel require a slow but constant flow of water through the gravel to provide dissolved oxygen and carry away metabolic waste products. Eggs also require suitable temperature conditions, with mortality of eggs beginning at 13.3°C. (*Id.*, p. 2-60.)

Steelhead alevins emerge from the gravel five to eight weeks after the eggs have been deposited, between March and May depending on water temperature. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-56.) In water temperatures around 15.6°C, steelhead can emerge from the gravel in as short as three weeks. (*Ibid.*) Steelhead alevins disperse throughout the river, typically occupying shallow low velocity areas along the river margin. (MU-224, p. 2.) Steelhead fry and juveniles feed on a variety of invertebrates, including aquatic and terrestrial insects, amphipods and snails, and rely on large substrate such as boulders and large cobble to provide important shelter during high winter flows. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, pp. 2-16, 2-56.)

Juveniles typically rear for approximately one or two years. (R.T., October 22, 2003, p. 271:10-271:13.) Unless the river is highly productive, juvenile steelhead require two summers before reaching smolt size. (MU-224, p. 3.) The primary rearing areas for steelhead are pools and runs. (*Ibid.*) Favorable rearing temperatures for juvenile steelhead of northern stocks have been reported between 13 and 19°C. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-60.) Rearing steelhead have been found to function normally at dissolved oxygen concentrations of 7.75 mg/l or above and display symptoms of distress at 5 – 6 mg/l. (MU-226, p. 18.)

After one to two years when juveniles are 5-10 inches long, they undergo physiological changes that adapt them to a life in saltwater, and become "smolts." Typically, smolts emigrate to the ocean from February through May, but the timing of migration is dependent upon stream flows. (FEIR, Vol. II, p. 4.7-3.) Smolts need sufficient flow and connectivity to migrate downstream to the ocean, and therefore flow is one of the most important considerations in providing for downstream migration. (*Id.*, p. 2.0-25; MU-226, p. 33.) Early closure of lagoons by sandbars due to low river flow may adversely affect out-migration of smolts. (MU-224, p. 3.) In the ocean, smolts will continue to grow into adults before returning to their natal streams to spawn. Unlike most salmonids, steelhead may emigrate back to the ocean as "kelts" (a salmon that has spawned) and return to spawn in later years. (*Ibid.*)

5.3.1.3.2 Steelhead Condition Prior to Bradbury Dam

Historically, the Santa Ynez River probably supported the largest steelhead run in southern California, with 20,000 to 30,000 adult fish. (NOAA-13, p. 6.)[35] The historic availability of, and access to, year-round rearing habitat with appropriate water temperatures and a wide network of upstream tributaries was likely one of the primary reasons for the large steelhead runs. (NOAA-7A, FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-3.) The substantial reduction in the amount of such accessible habitat in the Santa Ynez River system is a significant limiting factor. (R.T. October 23, 2003, p. 509:14-509:18; R.T. November 12, 2003, pp. 645:22 to 646:2.) As the result of flashy[36] flows in the lower portions of the Santa Ynez River, steelhead historically evolved to spawn and rear in the upper portions of the river above the current

[35] Historically, the numbers of steelhead recorded in the other rivers and creeks in the Southern California DPS were as follows: Ventura River – 4,000 to 6,000; Santa Clara River – 7,000 to 9,000; Malibu Creek – 1,000; and Matilija Creek – 2,000 to 2,500. (NOAA-12, pp. 5-6.)
[36] The Santa Ynez River responds strongly to rainstorms in the watershed, but there is little flow in the river in dry weather. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-40.)

site of Bradbury Dam where there were perennial sources of water with temperature and dissolved oxygen levels that were consistently more favorable. (R.T., October 23, 2003, p. 584:1-584:10; FEIR, Vol. II, p. 4.7-22.) Historically, the mainstem of the Santa Ynez River was primarily only used as a migratory corridor to the upper reaches. (*Id.*, p. 548:20-548:24.) Today, the lower Santa Ynez River mainstem and its tributaries below Bradbury dam are the only potential habitat accessible to steelhead.

Gibraltar and Juncal Dams, built in 1920 and 1930 respectively, were the first manmade obstructions to block steelhead access to the upper Santa Ynez River. Gibraltar Dam cut off approximately one third of the historic steelhead spawning and rearing habitat. (R.T., November 12, 2003, p. 644:7-644:9.) By 1944, fisheries biologists reported that forest fires, groundwater pumping for irrigation, and water storage and diversion in the upper watershed at Gibraltar and Juncal Dams had reduced stream flow during the dry season in the lower Santa Ynez River. (NOAA-10, p. 4.) In 1945, CDFW estimated that the steelhead run in the Santa Ynez River was only 13,000 to 25,000 adults. (R.T., November 12, 2003, pp. 643:23-644:1; NOAA-12, p.6.)

5.3.1.3.3 Impacts from Construction, Operation, and Maintenance of Bradbury Dam

The construction, operation, and maintenance of Bradbury Dam has been and continues to be a leading factor in the degraded condition of steelhead and their habitat in the Santa Ynez River. (FEIR, Vol. III, Appendix D, p. 29.) Bradbury Dam was constructed in 1953. By 1991, the Santa Ynez River steelhead run had been reduced from its historic annual level of 20,000 to 30,000 adult steelhead to a population of only 100 adult fish. (NOAA-12, p. 6.) There are several reasons for this decline related to the construction, operation, and maintenance of Bradbury Dam. One of the most significant impacts caused by the construction of Bradbury Dam was blocking access to a major portion of the historic steelhead spawning and rearing habitat upstream of the dam. (NOAA-4, p. 3; FEIR, Vol. III, Appendix D, p. 29; DFG-2, p. 17; MU-226, p. 32.)

The mainstem Santa Ynez River and its tributaries upstream of Bradbury Dam provide significantly more potential spawning and rearing habitat for steelhead than is available downstream of the dam. At the hearing, NMFS presented evidence that 29 percent of the potential steelhead spawning and rearing habitat is downstream of Bradbury Dam and 71 percent is available upstream. Specifically, there are 43 miles of habitat in the mainstem river upstream of Bradbury Dam and 248 miles in upstream tributaries. (NOAA-7A, NOAA-7B, NOAA-7C.). One of the critical recovery actions NMFS lists in the Draft Steelhead Recovery Plan is unimpeded volitional migration of steelhead to upstream spawning and rearing habitats. (FEIR, Vol. II, p. 2.0-43.) NMFS emphasized that restoring access to the Santa Ynez River mainstem and tributaries upstream of Bradbury Dam is critical to promote important life history traits such as the capacity to migrate long distances and withstand warmer temperatures. (*Id.*, p. 2.0-44.)

Since construction of Bradbury Dam, steelhead spawning and rearing has been limited to areas below the dam where conditions are less suitable for steelhead. (R.T., October 23, 2003, p. 549:4-549:6.) Without access to the upstream areas for spawning and rearing, the steelhead population in the Santa Ynez River is considered by NMFS to be extremely vulnerable to extinction because of drought or other climatic phenomenon. (*Id.*, p. 584:16-584:21.)

Operations of Bradbury Dam have modified the timing and reduced the amount of migration flows, and have even reduced the number of days that migration is possible in some years. (FEIR, Vol. III, Appendix D, p. 29; MU-226, p. 6; MU-224, p. 3.) These flow modifications have constrained the biologically important genetic and life cycle diversity attributes of the population that increase its ability to withstand catastrophic events such as droughts. (FEIR, Vol. II, p. 2.0-29.) Operations of the dam have also resulted in an increased potential for mortality from stranding and desiccation caused when surface flows in tributaries where fish are residing are disconnected from the main channel. (FEIR, Vol. III, Appendix D, pp. 29, 52.)

The regulation of flows and the trapping of sediment in the Santa Ynez River by Bradbury Dam have also resulted in a modification of stream hydrology and sediment transport characteristics in a manner that affects downstream habitat quality and quantity. (NOAA-3, p. 3.) Reducing the sediment supply to downstream reaches diminishes the size and number of pools and riffles. (*Ibid.*) Trapping the sediments also reduces the size and extent of gravel patches used for steelhead spawning. (*Ibid.*) In addition, the reduction in the sediment load below Bradbury Dam has affected the riparian vegetation by decreasing the rate of riparian recruitment and the associated food production and temperature benefits that riparian vegetation provides. (FEIR, Vol. II, p. 4.8-6.)

Reservoir operations ~~to satisfy downstream water rights~~ also modify natural flow patterns in a manner favorable to predator species and other exotic species. (FEIR, Vol. II p. 4.7-25.) Specifically, reservoir operations have homogenized naturally flashy flows through reductions in high flow and low flow events. (*Ibid.*~~)~~; *id.*, p. 4.8-6; NOAA-3, p. 2; R.T. November. 12, 2003; p.655:7–655:24.) Predation mortality of all size classes of steelhead, which is exacerbated by the presence and operations of the dam, has been identified as a significant factor affecting population abundance and survival in the Santa Ynez River. (FEIR, Vol. II, p. 4.7-23.) Identified predators include largemouth and smallmouth bass, channel catfish, sunfish, crappie, and other piscivorous (fish eating) fishes. (*Ibid.*) Largemouth bass, introduced into Cachuma Reservoir, have successfully colonized and maintained a population throughout the lower Santa Ynez River. (*Ibid.*) Juvenile largemouth bass have also been observed in Hilton and lower Salsipuedes Creeks, although none have been observed in Hilton Creek since initiation of a watering system in 2000. (*Ibid.*) Co-occurrence of largemouth bass and steelhead has been documented at several sites within the mainstem. (*Ibid.*) Although each species appears to utilize different areas of the pools, predation pressure is thought to increase as pools shrink during the summer months. (*Ibid.*) Bullfrogs and crayfish have also been observed preying on eggs and juvenile steelhead. (*Ibid.*) Bullfrog numbers have increased since 2000, as flows have been more consistent and longer reaches of the mainstem remain wetted. (*Ibid.*)

The proliferation of the American beaver (*Castor canadensis*) population may also be due to the modification of Santa Ynez River flows resulting from the construction of Bradbury Dam. Beaver activity is highest in areas with perennial flows. (FEIR, Vol. II, p. 4.7-22.) Their dams are an impediment to fish passage in the mainstem, especially in dry years. (MU-226, p. 6; CT-39, pp. 1-2.) The dams impound water especially at low flows. (R.T., October 22, 2003, p. 301:22-301:23; MU-224, p. 18.) Beaver dams also alter channel velocity, changing local erosion and deposition patterns, altering riparian vegetation and large woody debris cover. (FEIR, Vol. II, p. 4.7-22.) Beavers have been observed in the Highway 154 Reach, and Salsipuedes and El Jaro tributaries. (*Ibid.*) Pools formed by beaver ponds dominate habitat two miles below the Lompoc Wastewater Treatment Plant. (*Id.*, p. 4.7-18.) Over 100 dams were observed in fall 2009 between Bradbury dam and the ocean. (*Id.*, p. 4.7-22.)

5.3.1.3.4 Determining Sufficient Steelhead Condition Post Construction of Bradbury Dam

Although Fish and Game Code section 5937 requires that enough water be released to keep fish below the dam in "good condition", this term is not defined. The State Water Board needs criteria to be able to determine the status of the fishery. Dr. Peter Moyle, professor of fisheries biology at the University of California, Davis, and an expert witness for CalTrout, has developed and proposed a definition of fish in good condition. Both Dr. Robert Titus, CDFW staff environmental scientist and Ms. Baldrige supported the use of Dr. Moyle's definition for good condition. Ms. Baldrige co-authored the paper with Dr. Moyle in which this definition of good condition was developed. (MU-226, pp. 43, 46; R.T., October 22, 2003, pp. 386:13 to 388:2.) Dr. Titus testified that Dr. Moyle's approach for defining good condition is perhaps the most applicable for achieving sustainable production of steelhead in the Santa Ynez River system. (DFG-4, p. 6; R.T., October 23, 2003, p. 518:12-518:16.) Based on the information in the record, Dr. Moyle's definition appears to be a reasonable and proper interpretation of "good condition," as the term is used in section 5937 of the Fish and Game Code. Accordingly, Dr. Moyle's definition will be used in this order.

Dr. Moyle defines good condition at three consecutive levels: the individual, the population, and the community. According to Dr. Moyle, to satisfy Fish and Game Code section 5937, fish have to be in good condition at all three levels. (CT 70, p. 3.)

Individual Level

According to Dr. Moyle, at the individual level, fish in good condition must be healthy. This means they must be relatively free of diseases and parasites, have robust appearance (i.e., have a suitable weight for a given length), have a growth rate appropriate for the region (i.e., not be stunted), and should respond in an appropriate manner to stimuli (e.g., can avoid predators, including anglers). (CT-70, p. 2.) If water releases from a dam are unfavorable (e.g., too warm, too low, too turbid) to a given species of fish, it is likely that individuals will be underweight, suffer from outbreaks of parasitic infections, and be more susceptible to predators, especially non-native predators such as largemouth bass, or to dying of stress-related disease. (*Ibid.*) Ms. Baldrige testified that the criterion of healthy individuals is met for steelhead in the Santa Ynez River, based on snorkel survey data between 1993 and 1999. (MU-226, p. 43.) Fish captured in the trapping operations and those observed during snorkel surveys are disease-free, exhibit appropriate size, and are able to exhibit predator avoidance reactions. (*Ibid.*)

Population Level

For fish to be in good condition at the population level, each population must:

1) Be made up of healthy individuals,
2) Have multiple age classes, which is evidence of successful reproduction and recruitment, and
3) Have a viable population size.

(CT-70, pp. 2-3.)

While the steelhead fishery in the Santa Ynez River may have sufficiently healthy individuals, which meet the first criterion for a population in good condition, it does not appear to have adequate multiple age classes or a viable population size.

The second criterion for good condition of the population level is having multiple age classes. Ms. Baldrige testified that steelhead are completing their life-history in the Santa Ynez River and although observed numbers are low, multiple age classes are present.

(MU-226, p. 43.) There is evidence of reproduction, emergence, rearing, smolting, and returning adults. (*Id.*, pp. 43-44.) While there may be multiple age classes present, as Mr. Thomas Keegan, a senior fisheries scientist who appeared as an expert witness on behalf of CalTrout, testified, steelhead that are present in the mainstem below Bradbury Dam are not abundant in multiple age classes. Dr. Charles Hanson, a senior fishery biologist who appeared as an expert witness on behalf of the Member Units, presented a graph entitled, "Total Fall Standing Crop *O. mykiss* (Hilton Creek and Mainstem to Alisal)," which contains information compiled from snorkel survey data and visual observations each fall from 1995 to 2011. (MU-294, p. 2; R.T., March 29, 2012, pp. 260:13-261:10.) Dr. Hanson's graph shows as many as 13,500 steelhead were present in 2006. (MU-294, Figure 1 p. 2.) However, as Dr. Hanson confirmed, the graph does not differentiate between rainbow trout and steelhead, or between juveniles and adults. (R.T., March 30, 2012, p. 26:3-26:11.) This is not uncommon, as resident and anadromous life forms are difficult to distinguish based on visual observation, particularly at the juvenile stage. (R.T., March 29, 2012, pp. 260:22 to 261:3.)

Dr. Mark Capelli, area recovery coordinator for NMFS for the South Coastal portion of California, gave some perspective to this figure by describing the 1945 CDFW report that documented the 1944 fish rescue by CDFW of over a million young steelhead from the partially dry bed of the Santa Ynez River above the site of the proposed Cachuma Dam. The report further noted that these fish probably represented only a small fraction of the young steelhead produced, since large numbers migrated downstream prior to the start of the rescue operations or remained in localities inaccessible to the rescue crews. The steelhead population in the Santa Ynez River has significantly declined from historical levels of over a million juvenile steelhead in 1944, to a recent high of less than 14,000 steelhead and rainbow trout. The number of smolts captured from 2000 to 2010 in Hilton Creek, Salsipuedes Creek, and the mainstem lower Santa Ynez River peaked at 438 in 2006. (FEIR, Vol. IV, Appendix G, Table 1 and Figure 2.)

The observed numbers of adult steelhead are also extremely low. Information regarding the current condition of steelhead is provided by trapping results, snorkel survey results, and habitat assessments from 2005 to 2010, which are contained in Appendix G of the

FEIR. In Salsipuedes and Hilton creeks, and in the lower mainstem of the Santa Ynez River, the number of steelhead adults captured from 2005 – 2010 peaked with only 16 in 2008. No adult steelhead were captured in 2000, 2002, 2004 or 2007. One adult was captured in each of the years 2003, 2005, 2006, 2009 and 2010. Four adults were captured in 2001. (FEIR, Vol. II, p. 2.0-40; *Id.*, Vol. IV, Appendix G, Table 2 and Figure 3.) Fish traps are not intended to capture all adult fish in the system. However, these figures indicate that the number of adult steelhead is very low. Dr. Capelli testified that according to a 1996 assessment by NMFS, the estimated total run size for the Santa Ynez River was reported at less than 100 adults per year, a decline of greater than 99 percent since 1950. (NOAA-6, p. 2.) Mr. Craig Wingert, a fishery manager at NMFS, testified that a population size of less than 100 adult steelhead on a river the size of the Santa Ynez is not viable or large enough to maintain genetic diversity in the long run. (R.T., November 12, 2003, p. 754:12-754:25.)

The last criterion for meeting the population level criteria of good condition is a viable population size. According to Dr. Moyle, a viable population is one that is large enough that it will not go extinct from random factors or unusual events, such as a major drought. (CT-70, p. 3.) Dr. Moyle testified that the determination of the actual viable population size for a species usually requires extensive study of its demographic characteristics, such as age structure, mortality rates, and growth rates. (*Id.*, p. 2.) According to testimony by Ms. Baldrige, Dr. Titus, and Mr. Dennis McEwan, who is a Senior Environmental Specialist with CDFW, a viable population size for Santa Ynez River steelhead is currently unknown.[37] (R.T., October 22, 2003, pp. 389:16-389:17, 423:3-423:5, 444:14-444:19, 445:8-445:9 [Ms. Baldrige]; R.T., October 23, 2003, p. 528:16-528:24 [Dr. Titus and Mr. McEwan].)

One potential estimate for viable population size discussed during the hearing was the steelhead run size in the NMFS Draft Steelhead Recovery Plan (Recovery Plan). To be

[37] NMFS indicated in their December 8, 2016 comment letter that information regarding the metrics that are pertinent to the viability for either an individual population of steelhead or the Southern California DPS of steelhead are set forth in the NMFS Southern California Steelhead Recovery Plan (SCSP). However, the contents of the SCSP are not part of the evidentiary hearing record as described in footnote 29. (NMFS, December 8, 2016 comment letter, p. 10.)

considered viable, the Recovery Plan indicates that the steelhead run size needs to be sufficient to result in an extinction risk of less than 5 percent within 100 years, which is estimated at 4,150 spawning adults per year for the Southern California DPS. (FEIR, Vol. II, p. 2.0-43.) However, there was conflicting testimony regarding the geographic extent of the 4,150 fish needed to meet this criterion. Dr. Hanson testified that the separate watersheds comprising the Biogeographic Population Group,[38] which are groups of watersheds and subwatersheds that comprise the DPS, are treated as individual steelhead populations for the purposes of meeting the run criteria in the Recovery Plan. (R.T., March 30, 2012, p. 28:5-28:7.) According to Dr. Hanson, this could mean that 4,150 steelhead would be the population size necessary for each of the individual watersheds in Southern California DPS. (*Id.*, p. 28:8-28:10.) However, based on his expectation of watershed production in Southern California, Dr. Hanson asserted that the recovery goal of 4,150 adult steelhead should not apply to individual river systems, but instead to the entire DPS. (*Id.*, pp. 28:20 to 29:5.) In contrast, Dr. William Trush, a geomorphologist and fish biologist who appeared as an expert witness on behalf of CalTrout, testified that NMFS estimated that the minimum viable population size for the Santa Ynez River is a run size of 4,150 adults for recovery of the species. (CT-120, p. 8.)

Historical steelhead information is relevant to this issue. The historic adult steelhead run size in the Santa Ynez River watershed averaged 20,000 fish. (CT-90, p. 3.) Evidence shows that the Santa Ynez River was of major importance as a spawning ground and nursery stream that supported the largest steelhead run in southern California. (CT-96, pp. 4-5, NOAA-6, p. 3.) In the late 1940s, the Santa Ynez River was recognized as the most productive steelhead river in Southern California. (CT-96, pp. 5-6.) The Santa Ynez River was likely among those river systems, if not the river system, that served as a key source of steelhead production for the DPS as a whole and served as a source population for many smaller streams before steelhead access to upstream spawning and rearing habitat was lost due to the construction of dams. (NOAA-2, p. 5.) Therefore, it is reasonable to conclude that the minimum viable population size for the Santa Ynez River

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[38] The Santa Ynez River is one of the four major rivers, along with the Santa Maria, Ventura, and Santa Clara Rivers, included in the Monte Arido Highlands Biogeographic Population Group. (FEIR, Vol. II, p. 2.0-42.)

is a run size of 4,150 adults. Regardless of which interpretation is the correct interpretation of the recovery goal, it is likely not possible to achieve recovery without a sufficiently robust population in the Santa Ynez River.

The Santa Ynez River steelhead has been listed as 'endangered' under the federal ESA because of its greatly reduced range and population size. (R.T., November 12, 2003, p. 802:10-802:14.) This means that the steelhead are a population considered to have a high risk of extinction in the near future. (*Ibid.*; accord 16 U.S.C. § 1532(6) [endangered species means "any species which is in danger of extinction throughout all or a significant portion of its range"].) Ensuring the ability of the Santa Ynez River steelhead population to continue to exist into the future while retaining its potential for recovery is critical to the DPS's survival and recovery. (FEIR, Vol III, Appendix D, p. 19.) Given this information and the low population numbers, especially for adult steelhead in the Santa Ynez River, the current population level is not meeting Dr. Moyle's population criterion for good condition.

Dr. Moyle and Ms. Baldrige testified that a reasonable surrogate for an actual population estimate for determining "good condition" is the presence of habitat or, as Dr. Moyle described it, "the presence of extensive habitat for all life history stages over long reaches of stream." (CT-70, p. 3 [Dr. Moyle]; R.T., October 22, 2003, p. 388:19-388:22 [Ms. Baldrige].) Dr. Trush testified that, based on his understanding of the number of miles of habitat below Bradbury Dam and general knowledge of the population of steelhead, he does not believe there is currently enough habitat available below the dam for all life stages of steelhead to avoid extinction. (R.T., March 29, 2012, p. 229:1- 229:8.)

<u>Community Level</u>

A fish community is in good condition where the community has lived for thousands, if not millions, of years as a predictable structure indicated by very limited overlap in the niches occupied by individual fish among the community and the presence of multiple levels in the food web. (R.T., November 12, 2003, p, 803:13-803:18.) A healthy fish community should be very resilient in recovering from extreme events, which is why size of the population and spatial extent of the habitat are important. (*Id.*, 2003, p. 803:19-803:21.)

To be healthy, a fish community must be persistent in species membership through time and should be replicated geographically. (*Id.*, p. 803:19-803:23.)

Ms. Baldrige testified that the fish populations in the Santa Ynez River fail to meet the criteria for good condition at the community level. The current fish species assemblage downstream of Bradbury Dam is dominated by non-native species. (CT-30, p. 4.) Ms. Baldrige stated that native fish populations in the Santa Ynez River may never be in good condition at the community level because of predation by exotic species and favorable habitat conditions for those predators. (R.T., October 22, 2003, p. 447:12-447:17.) Ms. Baldrige testified that these issues are difficult to address due to a source population of predators in Cachuma Reservoir and the lack of access for steelhead to mainstem habitat. (MU-226, p. 45.) Exotic species are often an indicator of habitat change, and the presence of numerous exotics often indicates poor habitat. (R.T., November 12, 2003, p. 855:16-855:18.)

Additional/Improved Habitat

To support a viable population of steelhead in the Santa Ynez River throughout the riverine life stages, adequate habitat quality and quantity must be available. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-16.) While habitat can be restored through physical restoration and improvement projects, many aspects of habitat are directly related to the flow of the river. Currently, over-summering rearing habitat is an important limiting factor for steelhead populations in the Santa Ynez River. (FEIR, Vol. II, p. 4.7-45.) The most important flow-related aspects of rearing habitat found to be limiting in the lower Santa Ynez River watershed are water quality, the amount of physical space available, and passage opportunities. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-34; MU-226, p. 9.) Without access to habitat above Bradbury Dam, at a minimum, more habitat will need to be provided below Bradbury Dam to improve the steelhead population's condition.

Increased flow can create additional habitat, improve the quality of habitat, and increase passage opportunities. All habitat types (riffles, runs, pools, glides) in the Highway 154, Refugio, and Alisal reaches increase with increases in flow. (MU-226, p. 10.) Increased flow can expand the width of the channel, providing additional inundated gravel areas, increasing water depth, and improving pool and run habitats, which are the primary rearing areas for steelhead. (MU-224, p. 3.) In addition to providing increases in specific limited habitat types, providing additional habitat in general may reduce predation pressure. (FEIR, Vol. II, p. 4.7-23.) Additional flow also benefits the steelhead fishery by supporting aquatic insects and riparian growth, which improve the quality of habitat. (FEIR, Vol. II, pp. 4.9-16, 4.7-12.) Additional flows can also increase passage and migration opportunities.

5.3.2 Passage Measures Needed to Protect Steelhead ~~Below~~in the Santa Ynez River

Testimony and evidence submitted by CDFW and NMFS clearly indicate the necessity of providing steelhead passage around Bradbury Dam. Prior to the construction of Bradbury Dam, steelhead accessed the upper reaches of the Santa Ynez River and could take advantage of the permanent water supplies in these reaches for spawning, rearing (the most limiting habitat), and summer refugia. (R.T. October 23, 2003, pp. 548:8 to 549:2; p. 554:9-554:13; NOAA-2, p. 5; NOAA-3, p. 2; NOAA-4, p.3; NOAA-5, p. 3; NOAA-6, pp. 3-4.) As stated earlier, 71 percent of the potential steelhead spawning and rearing habitat is upstream of Bradbury Dam with 43 miles of habitat in the main-stem river and 248 miles of habitat in the tributaries. (NOAA-7A, NOAA-7B, NOAA-7C.) The United States Forest Service (U.S. Forest Service) evaluated habitat conditions above Bradbury Dam and concluded that with passage for steelhead over Bradbury Dam, the Santa Ynez River could support a steelhead run of 1,800 to 4,000 adult steelhead. (CT-12, p. 9.) In addition to providing more habitat for steelhead, providing passage around Bradbury Dam may also help to maintain the anadromous life history traits of steelhead in the upper reaches and provide for life history and genetic diversity. (DOI-1f, Vol. II, Appendix E, p. E-4-7.) Currently, passage upstream of Bradbury Dam is not possible, and steelhead can only move downstream when there are spill events at the reservoir.

In 2000, to evaluate actions that could potentially benefit steelhead populations in the Santa Ynez River basin, SYRTAC created a sub group called the Upper Basin Work

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Group (UBWG)[39], who prepared initial recommendations whether these actions should be pursued further. (DOI-1f, Vol. II, Appendix E, p. E-1-1.) UBWG considered four alternatives to provide passage around Bradbury Dam including:

1) A fish ladder at Bradbury Dam,

2) A fish ladder from Hilton Creek to Lake Cachuma,

3) A bio-engineered fish passage channel that would pass fish around or into Lake Cachuma, and

4) Trap-and-truck operations to move returning adult steelhead from below Bradbury Dam into the upper basin.

UBWG recommended that a fish ladder over Bradbury Dam or a bioengineered fish channel not be considered due to concerns with costs and technical feasibility. Specifically, UBWG identified concerns over lack of certainty that a ladder would be successful, difficulty with getting juvenile fish downstream of the dam, the continuous flow needed throughout a fish channel, and concerns with introducing an ESA species in the reservoir which may prohibit recreational fishing. (DOI-1f, Vol. II, Appendix E, p. E-4-7.)

UBWG concluded that trap-and-truck operations were the most feasible option for upstream passage of adults and downstream passage for outmigrating smolts. However, UBWG found trap-and-truck operations faced challenges to implementation as well. (DOI-1f, Vol. II, Appendix E, pp. E-4-4 to E-4-7.) Due to these challenges, the UBWG recommended the implementation of habitat rehabilitation and enhancement efforts below Bradbury Dam be carried out and monitored, and that an Adaptive Management Committee continue to investigate opportunities to provide passage for steelhead. (*Ibid*; See R.T., October 23, 2003, pp. 520:21 to 521:16.) Given the importance of passage around Bradbury Dam to keeping steelhead in good condition in the Santa Ynez River and the preliminary nature of previous analyses into this issue and technological

[39] The administrative record does not contain information on the members who participated in the UBWG sub group. SYRTAC was composed of CDFW; NMFS; Reclamation; U.S. Forest Service; Natural Resource Conservation Service; CalTrout; Santa Barbara Urban Creeks Council; Central Coast Regional Water Quality Control Board; CCWA; Santa Barbara County Fish and Game Commission; California Coastal Commission; USFWS; CCRB; SYRWCD; SYRWCD, ID No. 1; SBCWA; and the City of Lompoc. (FEIR, Vol. II, p. 2.0-16.)

improvements since that time, as requested by the fish agencies, this order directs Reclamation, in consultation with the fisheries agencies, to further investigate the feasibility of providing passage around Bradbury Dam for steelhead adults and smolts.

5.3.3 Measures to Protect Steelhead Downstream of Bradbury Dam

This section describes and evaluates:

1) The two remaining relevant flow alternatives that the FEIR analyzed for the protection of public trust resources below Bradbury Dam;
2) The alternatives' effects on the steelhead fishery;
3) Hearing participants' feedback;
4) The water supply effects of the alternatives;
5) The measures the Board determines are necessary to protect public trust resources; and
6) The studies, monitoring and reporting requirements the Board will require to ensure those measures are appropriate and effective and to inform future potential decisions by the Board related to the Cachuma Project.

~~5.3.1.4~~5.3.3.1 *Alternative 3C*

~~5.3.1.4.1~~5.3.3.1.1 Description of Alternative 3C

Currently, the Cachuma Project operates under the 2000 Biological Opinion, which is analyzed as Alternative 3C in the FEIR. Operations under the 2000 Biological Opinion/Alternative 3C include the measures being undertaken by Reclamation to prevent jeopardy to the continued existence of the steelhead below Bradbury Dam as determined by NMFS. The 2000 Biological Opinion/Alternative 3C contains mandatory terms and conditions, including operational changes that are required to implement 15 specific "reasonable and prudent measures" necessary to minimize take of the steelhead.[40] The 2000 Biological Opinion/Alternative 3C requires implementation of most of the operational changes and conservation measures described in the 1999 Biological Assessment, along

[40] Table 2-4A of the FEIR, entitled Summary of Reasonable and Prudent Measures/Terms and Conditions Described in the Cachuma Project Biological Opinion and Status of Compliance, summarizes the implementation and compliance status for each measure and term and condition. (FEIR, Vol. II, pp. 2.0-21 to 2.0-24)

with additional operational, reporting and monitoring requirements. The 2000 Biological Opinion/Alternative 3C includes emergency winter storm operations, SWP mixing and associated water release restrictions, Hilton Creek gravity feed and pumped releases, Order WR 89-18 requirements, and conjunctive use of fish flow releases with a revised ramping schedule. The 2000 Biological Opinion/Alternative 3C also requires water releases from Bradbury Dam to meet mainstem rearing and passage flows as well as non-flow fish conservation measures, which are discussed in the following section.

~~5.3.1.4.2~~5.3.3.1.2 Rearing and Passage Flows

The 2000 Biological Opinion/Alternative 3C includes instream flow requirements designed to: 1) improve summer rearing habitat conditions for steelhead in lower Hilton Creek and in the mainstem from Bradbury Dam to the Highway 154 Bridge; and 2) increase the number of days that appropriate conditions are provided for migration between the mainstem river and tributaries near Bradbury Dam. (FEIR, Vol. II, pp. 2.0-28, 2.0-30.)

To increase rearing habitat below the dam, the 2000 Biological Opinion/Alternative 3C includes the Mainstem Rearing Flows identified in Table 1. As depicted in Table 1, the amount and location of the rearing flows depend on the amount of reservoir storage and spill. Maintaining the rearing flows for steelhead will provide increased low flow summer rearing habitat when compared with recent or historical conditions. (FEIR, Vol. III, Appendix D, p. 62.)

To supplement passage flows and increase the number of days that migration is possible from the mainstem river to tributaries near Bradbury Dam, the 2000 Biological Opinion/Alternative 3C allocates 3,200 af of water to the Fish Passage Account upon surcharge of the reservoir. The water is required to be released between January and May to extend the receding limb of naturally occurring storm hydrographs once the sandbar at the mouth of the river has been naturally breached. The 2000 Biological Opinion/Alternative 3C requires releases from the Fish Passage Account following a storm event when flows have receded to 150 cfs at Solvang. Storms are defined as flows of 25 cfs or greater at the Solvang U.S. Geological Survey gauge location. If storms do not produce 150 cfs at Solvang, but flows exceed 25 cfs, then releases are required achieve 150 cfs. The combination of natural flows and the Fish Passage Account releases will provide an average of 14 days or more of passable flows to facilitate steelhead migration to the mainstem and tributaries above Alisal Road. (FEIR, Vol. II, p. 2.0-31.)

~~5.3.1.4.3~~5.3.3.1.3 **Habitat Improvement Projects**

Tributary habitat provides an extremely important opportunity for steelhead. (R.T., October 22, 2003, p. 289:15-289:16.) Protection and enhancement of steelhead spawning and rearing habitat in the tributaries will increase the availability and quality of habitat for steelhead. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. iii.) Good quality habitat for steelhead exists in both Salsipuedes Creek and its tributary El Jaro Creek. (FEIR, Vol. III, Appendix D, p. 28.) Salsipuedes Creek has good canopy cover, as well as pool and riffle areas for spawning and rearing habitat near its confluence with El Jaro Creek. Nojoqui Creek appears to contain good spawning and rearing habitat in its upper reaches. (*Ibid.*) One and a half to 3 miles upstream from the confluence of Quiota Creek and the Santa Ynez River, good canopy conditions provide shading within this section and pool habitats have good depth and complexity of instream cover. In addition, numerous undercut banks exist, particularly in pools, which provide excellent rearing habitat. Substrate is composed of larger size gravel, cobbles, and boulders. (*Id.*, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-48.)

As discussed above, the construction of Bradbury Dam severely limited access to steelhead spawning and rearing habitat. To address this, Reclamation proposed in the 1999 Biological Assessment to implement physical habitat improvement projects, including the removal of fish passage barriers on tributaries to the Santa Ynez River below Bradbury Dam and to complete them by 2005. The impediments include culverts, road crossings, and boulder cascades. Removal of these impediments would increase access to suitable spawning and rearing habitats, thereby expanding the total available habitat for steelhead on the lower river. The 2000 Biological Assessment identified the highest priority tributaries as being Hilton, Salsipuedes, El Jaro, and Quiota creeks because they have perennial flow in their upper reaches and can support spawning and rearing. (FEIR, Vol. III, Appendix C, p. 3.-47.)

The 2000 Biological Opinion/Alternative 3C requires the removal of at least 11 passage impediments on the following tributaries: Hilton Creek (one on federal land and one under Highway 154); Salsipuedes Creek (Highway 1 Bridge); Quiota Creek (six road crossings); El Jaro Creek (one road crossing); and Nojoqui Creek (one road crossing). (FEIR, Vol. III, Appendix D, p. 14.) During implementation of tributary passage projects, the 2000 Biological Opinion/Alternative 3C requires Reclamation to minimize turbidity, sedimentation,[41] loss of riparian vegetation and to relocate steelhead. (*Id.,* p. 68.) The 2000 Biological Opinion concludes that approximately 12 miles of tributary habitat will be made more accessible to steelhead through implementation of the proposed projects discussed above. (FEIR, Vol. III, Appendix D, p. 43.) Ms. Baldrige testified that since adoption of the 2000 Biological Opinion, Reclamation and the Cachuma Member Units have implemented projects to make an additional 13.9 stream miles of steelhead habitat available. (MU-290, p. 2.)

Of the 11 tributary improvement projects required by the 2000 Biological Opinion/Alternative 3C, three have been completed, two were proposed for removal from the 2000 Biological Opinion,[42] and six road crossing projects on Quiota Creek were in design in December 2011 when the FEIR was completed. (FEIR, Vol. IV, Appendix G, Table 22.) Of the three completed projects, the Hilton Creek Cascade Chute Project provides steelhead access to 2,980 feet of suitable habitat. (*Id.*, Vol II, p. 2.0-32.) The Salsipuedes Creek Highway 1 Fish Passage Project successfully restored passage to

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[41] During the implementation of the tributary improvement projects, deposition or accumulation of fine sediments (sedimentation) may occur. Increases in fine materials from sedimentation, or cementing of gravels with fine materials, restrict water and oxygen flow through the redd to the fertilized eggs. These restrictions increase egg mortality. (MU-224, p. 3.)

[42] Reclamation has not considered constructing the Hwy 154 Culvert on Hilton Creek project due to potential legal challenges from an adjacent landowner and design constraints related to the culvert gradient being too steep for fish passage. (FEIR, Vol. II, p. 2.0-32.) Analysis of the passage impediment at the Hwy 101 Culvert on Nojoqui Creek, completed in 2003, found that implementation of the project was not warranted due to the lack of significant biological benefit and the high cost associated with enhancing passage. Nojoqui Creek was initially designated as critical habitat for steelhead in the lower Santa Ynez River, but this designation has since been removed. (*Id.*, p. 2.0-35.) In December 2005, NMFS was informed that these two projects would not be completed. (MU-290, p. 2.)

12.5 miles of suitable habitat for juveniles and adults. (*Id.*, pp. 2.0-32 to 2.0-33.) The Cross Creek Ranch on El Jaro Creek Project restored 250 feet of channel bank and installed a series of five rock weirs within the active channel to allow fish passage over a low flow crossing on El Jaro Creek. (*Id.*, p. 2.0-34.)

In addition to the above, other habitat improvements have also been completed including:

1) The Hilton Creek Watering System, completed in 2000, provides year-round flows of cool, well-oxygenated water from Lake Cachuma via three separate outlets to Hilton Creek and the Stilling Basin (FEIR, Vol II., pp. 2.0-35 to 2.0-36);

2) The Salsipuedes Creek Jalama Road Bridge Fish Passage Project, completed in 2003, provides additional passage opportunities and oversummering habitat on Salsipuedes Creek (FEIR, Vol II., p. 2.0-33);

3) The El Jaro Creek Rancho San Julian Fishway, completed in 2009, provides passage over a 7-foot-high migration barrier on El Jaro Creek (FEIR, Vol II., p. 2.0-34); and

4) The El Jaro Creek Demonstration Projects which identify feasible and cost-effective sediment management solutions on El Jaro Creek. (Id., p. 2.0-33.) By 2011, three projects had been completed that reduced erosion within the creek which involved replacing a culvert, filling of a scour hole with large boulders, and floodplain enhancement. (FEIR, Vol II., p. 2.0-33.)

The 2000 Biological Opinion required Reclamation to reinitiate consultation if the projects were not completed by 2005. Because Reclamation did not complete all of the required projects by 2005, Reclamation reinitiated consultation in December 2005. The impacts of the Quiota Creek improvement projects have been evaluated at a programmatic-level under CEQA; however, they have not undergone a project-level review. (FEIR, Vol. II, pp. 5.0-1 to 5.0-2.) COMB is the appropriate CEQA lead agency to conduct a project-level environmental review of any non-flow habitat enhancement measures that it is funding and implementing. (*Ibid.*, p. 5.0-1.) This order does not require completion of the tributary improvement projects on Quiota Creek.

~~5.3.1.4.4~~5.3.3.1.4 Evaluation of Alternative 3C

Implementation of the 2000 Biological Opinion/Alternative 3C benefits the steelhead population. Implementation of the 2000 Biological Opinion/Alternative 3C substantially increases the frequency of years with passage from the ocean to the dam for anadromous steelhead and the amount of steelhead spawning habitat. (FEIR Vol. II, pp. 4.7-46 to 4.7-48.) Frequency and quality of fry rearing habitat flows under 2000 Biological Opinion/Alternative 3C significantly improves fry rearing conditions compared to baseline operations (Alternative 2). (*Id.*, pp. 4.7-46 to 4.7-50.) In addition, because of implementation of the 2000 Biological Opinion/Alternative 3C, riparian vegetation has increased since 2000 and canopy coverage is increasing as well. (*Id.*, p. 4.7-49.)

As described above, steelhead habitat conditions have improved from baseline conditions due to implementation of the increased flows under the 2000 Biological Opinion/Alternative 3C. However, according to Dr. Trush, the flows implemented under the 2000 Biological Opinion are not adequate to result in a viable steelhead population. (R.T. March 29, 2012, p. 228:2-228:6.) He testified that, "without a measurable increase in the predicted or observed adult run size for the lower Santa Ynez River, the FEIR cannot conclude that flows implemented under the 2000 Biological Opinion have resulted in increased abundance of steelhead in the lower Santa Ynez River." (CT-120, p. 6.) Dr. Trush further opined that, given the implementation of the 2000 Biological Opinion for 16 years without any measurable increase in the adult steelhead population, the 2000 Biological Opinion would not by itself be sufficient to protect steelhead as a public resource. (See generally CT-120, pp. 6-8 [discussing population viability].) "More smolts, and larger smolts, are needed to produce more adults, but there is no reasonable basis to expect this to occur under the provisions of the 2000 BiOp given the outcomes from the last 10 years." (CT-120, p. 8.)

Dr. Hanson testified that it could take 80 to 100 years to fully take advantage of the kind of habitat restoration actions and the other actions that are being taken within the basin to fully recover the steelhead populations. (R.T., March 30, 2012, p. 5:4-5:8.) While the Board acknowledges the benefits of the 2000 Biological Opinion/Alternative 3C, the limited timeframe between its implementation and the most current information in the record regarding the condition of the steelhead population as a result of those efforts, and the realistic timeframe for recovery, for the following reasons, the Board finds that the

2000 Biological Opinion/Alternative 3C is insufficient by itself to restore steelhead in the Santa Ynez River watershed to good condition.

While the 2000 Biological Opinion/Alternative 3C and the Board's objectives for the steelhead fishery are consistent, they are not the same. Both CDFW and NMFS, expressed concerns that 2000 Biological Opinion/Alternative 3C might not afford adequate protection to steelhead to achieve compliance with the Public Trust Doctrine. (R.T., November 12, 2003, p. 746:1-746:17.) The fundamental objective of the requirements in the 2000 Biological Opinion/Alternative 3C is to protect the Santa Ynez River steelhead population at a level sufficient to avoid jeopardy. It is not designed to achieve fish below a dam in good condition under section 5937 of the Fish and Game Code. The 2000 Biological Opinion/Alternative 3C requirements are intended to substantially enhance habitat conditions for steelhead in an effort to promote recovery of the Santa Ynez River steelhead population. But as clarified by Mr. Wingert, the measures identified in the 2000 Biological Opinion are not intended to restore the steelhead to the point that the fishery is a viable, self-sustaining population, which would be necessary to meet the criteria for fish in good condition. (*Id.*, Vol. III, Appendix C, 2000 Revised Biological Assessment, p. 3-7; NOAA-1, pp. 1-2; R.T., November 12, 2003, p. 745:9-745:14.)

Additionally, the 2000 Biological Opinion/Alternative 3C may not achieve the intended minimum protections. The 2000 Biological Opinion/Alternative 3C requirements represent the minimum flows and other measures needed to support the continued survival of steelhead in the Santa Ynez River. (FEIR, Vol. III, Appendix C, 2000 Revised Biological Assessment, pp. 3-6 to 3-7; *Id.*, Vol. II, p. 4.7-26; but see FEIR, Vol. III, Appendix D, p. 67.) However, NMFS acknowledges that it cannot accurately predict if continuous surface flows will be maintained by releases made to meet the minimum flows and data is unavailable to assess the effect of those flows beyond ten miles below the dam. (FEIR, Vol. III, Appendix D, p. 52.) According to CDFW, evidence submitted in the Cachuma hearing suggests that despite the fact the 2000 Biological Opinion has been in effect for several years, the Cachuma Project does not comply with Fish and Game Code section 5937. (CDFW Closing Brief, p. 7.)

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Adding further uncertainty to the protection the 2000 Biological Opinion/Alternative 3C provides is the incomplete implementation of its requirements. Reclamation did not complete some of the required habitat improvement projects. Without full implementation of the requirements of the 2000 Biological Opinion/Alternative 3C, it is uncertain whether the Cachuma Project will cause jeopardy to the steelhead below Bradbury Dam, which is one of the reasons reinitiation of consultation was required. In Salsipuedes and Hilton creeks, and the lower mainstem of the Santa Ynez River, the number of anadromous steelhead adults captured from 2005 to 2010 peaked with 16 in 2008. (FEIR, Vol. II, p. 2.0-40; *id.*, Vol. IV, Appendix G, Table 2 and Figure 3.) Ten years after the implementation of the 2000 Biological Opinion, the Santa Ynez River steelhead population is not showing signs of recovery.

In light of the uncertain benefits of the 2000 Biological Opinion, both CDFW and NMFS requested that, if the Board incorporates the 2000 Biological Opinion into Reclamation's Permits, it only do so on an interim basis as part of a program that includes development of additional measures to provide adequate protection of steelhead in the lower Santa Ynez River. (CDFW Closing Brief, pp. 2, 12-13, 15; NMFS Closing Brief, p. 13; R.T., November 12, 2003, p. 628:4-628:9.) CDFW requested that the Board evaluate the effectiveness of the 2000 Biological Opinion in keeping steelhead in good condition, and mandate a study of the feasibility of providing fish passage around Bradbury Dam. (CDFW Closing Brief, pp. 13, 22.) CDFW also requested that the Board reopen Reclamation's Permits at a date certain or upon a future triggering event to analyze whether alternative flow releases are necessary to achieve full compliance with the Public Trust Doctrine. (*Id.*, p. 12.) Similarly, NMFS stressed that information concerning the needs of the steelhead in the Santa Ynez River, such as water temperature requirements and instream and fish passage flows, is incomplete, and the feasibility of providing passage around Bradbury Dam should be studied further. (NMFS Closing Brief, pp. 11-12.) NMFS provided testimony indicating that restoring passage around Bradbury Dam, where the majority of the historic spawning and rearing habitat occurred and still persists, is necessary to restore viable steelhead runs to good condition in the Santa Ynez River and therefore protect the public trust interest in the steelhead resources of the Santa Ynez River. (NOAA-2, p. 5; NOAA-4, p.3; NOAA-5, pp. 1 and 3, NOAA-6, p.4; R.T., November

12, 2003, p. 748:3-748:11.) NMFS recommended that the Board not rely upon the analyses and conclusions of the 2000 Biological Opinion because reinitiation of consultation under the federal ESA is currently required, which will result in a new biological opinion. (R.T., March 29, 2012. p. 162:11-162:16.)

~~5.3.1.5~~5.3.3.2 *Alternative 5C*

~~5.3.1.5.1~~5.3.3.2.1 Description of Alternative 5C

In response to CalTrout's comments on the 2003 DEIR, the State Water Board developed Alternative 5C, which is a modified version of an alternative flow regime proposed by CalTrout (Table 2 Flows). Table 2 Flows are based on a 1989 Santa Ynez River draft Instream Flow Incremental Methodology (IFIM) study (Draft IFIM) conducted by the Department of Water Resources (DWR). (R.T., November 12, 2003, p. 791:4-791:15; CT-37.) Mr. Keegan, who appeared as an expert witness on behalf of CalTrout, testified that the IFIM is generally recognized as the best predictive method for determining potential habitat. An IFIM study is a transect-based methodology that uses a computer model called a Physical Habitat Simulation System (PHABSIM) to perform the analysis portion of an IFIM. (R.T., November 12, 2003, p. 818:6-818:15; CT-37, pp. 10, 31.) The primary parameters used in the model are depth, velocity, substrate, and cover, the primary habitat attributes for salmonids. (R.T., October 23, 2003, p. 592:13-592:18.) The objective of the PHABSIM model is to predict the amount of habitat provided at different stream levels. (NOAA-4, p. 2.)

Implementation of the CalTrout-recommended Table 2 Flows, in all water year types, would require Reclamation to release significantly more water from Bradbury Dam to protect fishery resources than required pursuant to the 2000 Biological Opinion. (FEIR, Vol. II, p. ES-5.) In order to minimize impacts to Cachuma Project yield, under Alternative 5C, the Cachuma Project would operate under two different sets of hydrologic conditions for releases of water from Cachuma Reservoir for fish. In years when the runoff condition is determined to be wet or above normal, the criteria for fish water releases would be based on the higher Table 2 Flows. In other years, when the runoff condition is determined to be below normal, dry, or critical, the criteria for fish water releases would be the same as the operating criteria under the 2000 Biological Opinion/Alternative 3C.

The water year hydrologic classification for the Santa Ynez River is based on inflows to Cachuma Reservoir for the period 1918 to 1993 (76 years) as indicated in the Santa Ynez River Hydrology Model (SYRHM) used in the analysis of the FEIR.[43] Water year classification was conducted to determine five water year types based on roughly twenty-percentile groupings of ranked data. The FEIR describes the development of the five water year types in greater detail. (FEIR, Vol. IV, Appendix F, Draft Technical Memorandum No. 5, pp. 7-8.)

Under Alternative 5C, the Table 2 Flows are triggered when the cumulative Cachuma inflow (beginning October 1) of 33,307 af is first reached during a water year. The probability of reaching the wet or above-normal year classification is highest in the month of February, with about 70 percent of these year classes (wet or above-normal) known by February or earlier. When the cumulative inflow (beginning October 1) to Cachuma Reservoir has not reached the wet or above-normal year classification, the operating criteria for fish water releases in Alternative 5C is the same as the 2000 Biological Opinion/Alternative 3C. (FEIR, Vol. IV, Appendix F, Draft Technical Memorandum No. 5, p. 8.)

~~5.3.1.5.2~~5.3.3.2.2 **Evaluation of Alternative 5C**

The FEIR concluded that implementation of Alternative 5C would have beneficial effects on the Santa Ynez River steelhead population. The FEIR developed scoring criteria to compare and evaluate the alternatives and their flow-related effects on steelhead habitat. Specifically, the FEIR scored the alternatives effects on fish migration, spawning habitat, and fry and juvenile rearing habitat. Scores ranged from zero (0) to five (5) with higher

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[43] The SYRHM includes operations of Juncal, Gibraltar, and Bradbury Dams, the Santa Ynez River Alluvial Groundwater Basin, and Santa Ynez River recharge (percolation) in Lompoc Plain Groundwater Basin. The model uses historic records of rainfall, runoff, evaporation, and tunnel infiltration for the period 1918 through 1993. Reservoir releases, diversions, stream flow percolation, groundwater pumping, and depletions are based on monthly time steps. The model includes Cachuma Project operations under State Water Board Order WR 73-37 as amended by Order WR 89-18 (Santa Ynez River Hydrology Model Manual, 9/8/1997). In addition, the model has been expanded to include releases for fisheries and SWP water deliveries through the Bradbury Dam outlet works.

scores of four (4) or five (5) given to flows likely to provide more habitat and lower scores of zero (0) or one (1) given for flows likely to provide less habitat. The habitat scores are derived from the average monthly flows calculated using simulated mean daily flows for the 76-year period of record (1918-1993) for each alternative using the SYRHM. The FEIR concluded that, in comparison to Alternative 2 (baseline conditions), Alternative 5C would result in substantial increases in the frequency of years with passage opportunities for steelhead due to the higher instream flow requirements. Passage opportunities created under Alternative 5C are very similar to 2000 Biological Opinion/Alternative 3C with both alternatives receiving the same average score. (FEIR, Vol. II, p. 4.7-46.) Alternative 5C would also benefit steelhead through increased spawning and rearing habitat compared to baseline operations. (FEIR, Vol. II, p. 4.7-47, 4.7-48.) Alternative 5C has the highest average scores for steelhead spawning and fry rearing habitat. (*Ibid.*) While the 2000 Biological Opinion/Alternative 3C has slightly better average scores for juvenile rearing habitat, Alternative 5C is the only alternative to achieve scores of five (5) for fry and juvenile rearing. The FEIR concludes that Alternative 5C would provide the greatest benefit to rearing habitat due to the higher Table 2 Flows provided in wet and above normal years. (FEIR, Vol. II, p. 4.7-50.)

Specifically with regard to the Table 2 Flows, the Board received testimony from CalTrout-witness Mr. Keegan that the Table 2 Flows, if provided in all water year types, would likely maintain steelhead populations in good condition. (R.T., November 12, 2003, p. 824:2-824:5.) Mr. Keegan specifically testified that Table 2 flow requirements would provide sufficient flows to improve downstream rearing conditions into the Alisal Reach and likely below the Alisal Reach. Mr. Keegan stated that the increased flow through the riffles and glides would improve the quantity (e.g., improvements in velocity and depth) and quality (e.g., increased prey drift) of shallow rearing habitat, while improving pool habitat conditions (e.g., flow input to pool and through-pool flow.) (CT-30, p. 5.)

The validity of the Draft IFIM study, upon which the Table 2 Flows were based, however, was called into question by NMFS witness Dr. Stacy Li, a water rights and instream flow specialist and the SYRTAC. Dr. Li testified that he requested a new IFIM study because of concerns that the study completed in 1989 might not necessarily be representative of the channel conditions that presently exist. (R.T., November 13, 2003, p. 960:6-960:9.) In addition, the SYRTAC rejected the Draft IFIM's conclusions because the analysis did not take into account water quality considerations. Specifically, SYRTAC contended that the IFIM's conclusions regarding usable habitat in the reach below Highway 154 is not valid because warm water temperatures would limit the actual amount of usable rearing habitat available. The SYRTAC gave three other reasons for rejecting the Draft IFIM, which are: changes to the channel since the IFIM was conducted, faulty assumptions regarding access to certain reaches, and lack of incorporation of habitat suitability criteria for steelhead in the analysis.

Instead of relying on the Draft IFIM study, the SYRTAC conducted a top width study in 1997, which evaluated the relationship between various flows and the top width (or wetted width) of the river. The average top-width under different flows was then converted to acres of habitat. (FEIR, Vol. III, Appendix C, p. 4-5.) This study was used to evaluate the amount of spawning and rearing habitat that would be available under the flows required by the 2000 Biological Opinion. As described below the Board has evaluated these water quality issues and used the SYRTAC top width study to estimate the amount of spawning and rearing habitat that would be available under the Table 2 Flows.

<u>Temperature</u>

During the hearing, the effect of increased flows on temperature was raised as a potential issue that could limit the habitat gains of Table 2 Flows in summer months. The available data in the record regarding effects of water right releases on temperature are based mostly on a SYRTAC study conducted from 1993 to 1996. (MU-34.) SYRTAC studied the effects of late summer water right releases as required by Order WR 89-18. The released water had a temperature of approximately 17°C and was released at rates of 135, 70, and 50 cfs. The releases had varying effects on water temperature in the Santa Ynez River below Bradbury Dam. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-31.)

The SYRTAC study evaluated temperature criteria for rainbow trout and steelhead, specifically average daily water temperature greater than 20°C, or maximum daily temperature greater than 25°C. The study showed that average and maximum daily water temperatures, when compared to thermal tolerance indices for rainbow trout/steelhead, are within acceptable ranges at all locations downstream of Bradbury Dam during the late fall, winter, and early spring. However, during the summer months water temperatures may exceed the temperature thresholds for juvenile steelhead rearing at monitoring locations downstream from Highway 154, leading to the assertion that suitable temperatures cannot reliably be maintained in the Refugio and Alisal reaches during those months. (FEIR, Vol. II, pp. 4.7-9, 4.7-17 to 4.7-18; R.T., October 22, 2003, p. 275:18-275:21.)

During summer months, within one mile below the dam, the water right releases resulted in cooler temperatures at both surface and pool-bottom monitoring locations. (FEIR, Vol. III, Appendix D, p. 47.) This shows that increased flows can still have beneficial temperature effects even during summer months in the first reach below the dam. Effects of these water right releases on temperatures in Refugio and Alisal reaches appear less beneficial and will require additional study to determine definitively whether increased releases during particular times provide useable steelhead habitat. Information in the hearing record shows that water right releases in these reaches during summer months may result in the loss of thermal stratification within deeper pools and can increase both average and daily maximum water temperatures. (FEIR, Vol. III, Appendix D, p. 47; MU-34, p. 3-45.)

In the Refugio and Alisal reaches, during summer months, suitable temperatures may not be maintainable on a reliable basis during most years, even at flows of up to 20 cfs. (FEIR, Vol. II, pp. 4.7-17 to 4.7-18.) In both reaches, flows often become intermittent or non-existent during the summer. (*Id.*, 4.7-17.) However, cool water refuge pools have been observed in both reaches and, notwithstanding the high temperatures in these reaches, steelhead have been consistently observed during summer months under conditions of little or no surface stream flow. (FEIR, Vol. II, p. 2.0-41; MU-34, pp. xiv, 3-138, 5-22.) These thermal refuges play an important role during periods of warm temperatures for steelhead/rainbow trout rearing and may help mitigate increased temperature effects. (FEIR, Vol. II, p. 4.7-50; id., Vol. III, Appendix C, 1999 Biological

Assessment, p. 2-31; MU-34, p. 3-80.) Additional study may be necessary to ensure that additional flows do not impact thermal refugia by the loss of thermal stratification, but the evidence is currently inconclusive that increased summer releases negatively impact steelhead. Finally, Alternative 5C would implement the increased Table 2 Flows only in wet and above normal years when temperature control might be possible during summer months, further minimizing the potential effects on temperature of increased summer releases. (FEIR, Vol. II, pp. 4.7-17.)

Dissolved Oxygen

Evidence related to the effects of higher flows on dissolved oxygen levels indicates that higher flows may benefit dissolved oxygen levels. Monitoring data presented in the FEIR indicates that dissolved oxygen levels decrease with distance downstream of the Highway 154 Reach. (FEIR, Vol. II, p. 4.7-9.) Santa Ynez River flows provided by Order WR 89-18 releases in 1996 had positive effects on dissolved oxygen levels. The flows provided by Order WR 89-18 releases were sufficient to remove much of the algae from pool habitats and to create sufficient turbulence and mixing to sustain higher dissolved oxygen concentrations (7 mg/l) during the critical morning hours at all of the flows tested. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 2-33.) On July 16, 1996, prior to initiation of releases, early morning dissolved oxygen concentrations were over 8 mg/l in the Long Pool and at mile 3.4, but were 0.2 - 4.4 mg/l in shallow pools 3.4 to 13.9 miles downstream of Bradbury Dam.[44] (*Ibid.*) On August 2, 1996, after Order WR 89-18 releases had begun, the accumulated filamentous algal mats had been removed and early morning dissolved oxygen levels exceeded 7.45 mg/l at all sites 3.4 to 13.9 miles downstream of Bradbury Dam. (*Ibid.*)

Substrate

The Draft IFIM was used to provide an index of spawning habitat under two situations: existing substrate and improved substrate, which adds suitably sized gravel to the river. According to the Draft IFIM, with the existing substrates, 100 cfs is the optimum spawning

[44] In general, dissolved oxygen concentrations less than 5 mg/l are considered unsuitable for most fish species, including both rainbow trout and steelhead (FEIR, Vol. III, Appendix C, p. 2-31.)

flow. (R.T., November 12, 2003, p. 814:7-814:9.) However, with improved substrate, the optimum spawning flow is reduced to 48 cfs. (*Id.*, p. 814:10-814:12.) Mr. Keegan testified that adding additional spawning substrates would be needed to provide optimal spawning habitat with Table 2 Flows. (*Id*, p. 814:13-814:18.) However, the necessity of additional gravel substrates was disputed in the 1999 Biological Assessment. The 1999 Biological Assessment concluded that because of high flow events in 1995 and 1998 in the Highway 154 and Refugio reaches, additional gravels were moved into the areas from Hilton Creek and other tributaries to the extent that gravel availability is no longer an issue. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, pp. 2-19, 2-21.)

Estimated Increases in Habitat Based on SYRTAC Study

Notwithstanding the issues concerning the reliability of the IFIM study that formed the basis of the Table 2 Flows and the factors that could potentially limit habitat, which were discussed above in section 5.3.3.2.2, Evaluation of Alternative 5C, evidence in the hearing record demonstrates that those flows would increase available steelhead habitat. (MU-226B, p. A-1.) Estimates of additional habitat provided in the Highway 154, Refugio, and Alisal reaches resulting from Table 2 Flows are not included in the hearing record. Therefore, State Water Board staff analyzed evidence in the hearing record to create simple and conservative estimates of the juvenile rearing and spawning habitat gains from Table 2 Flows when compared to the maximum Table 1 Flows as required by the 2000 Biological Opinion/Alternative 3C in those three river reaches. The source material for this analysis was fully vetted through cross-examination and rebuttal during the evidentiary hearing.

To estimate the additional spawning and juvenile rearing habitat created by Table 2 Flows, State Water Board staff chose the maximum Table 1 flow rate requirement of 10 cfs as the baseline for comparison. This is a conservative baseline because this flow rate is only required in the Highway 154 reach and only when certain conditions are met. To estimate increased juvenile rearing habitat, State Water Board staff chose a flow rate of 20 cfs, the minimum Table 2 flow rate above 10 cfs. This is conservative as well because Table 2 requires flow rates at or above 20 cfs in approximately four months of the year, from February 15 until mid-June. Juvenile steelhead rear throughout the entire

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year and fry rear in the Santa Ynez River system from April through approximately August, so increased flow, notwithstanding the potential temperature issue discussed earlier, will increase steelhead rearing habitat. (FEIR, Vol. II, p. 4.7-45; MU-226B, p. A-1.) To estimate increased spawning habitat resulting from Table 2 flow requirements, State Water Board staff evaluated a flow rate of 50 cfs,[45] based on evidence in the record. Staff used 50 cfs as the comparison flow because 48 cfs is required from February 15 to April 14 per Table 2 as defined in the FEIR and the record provides top width measurements above 5 cfs in increments of 5. (See FEIR, Vol. II, pp. 3.0-19 to 3.0-20; MU-226B, p. A-1.) The steelhead spawning season is typically between February and April in the Santa Ynez River. (FEIR, Vol. II, p. 4.7-44; SWRCB-5, pp. 4-32 to 4-33.) The comparison resulted in an estimated minimum of four percent additional juvenile rearing habitat and 21 percent additional spawning habitat gained in the Highway 154, Refugio, and Alisal reaches.

To estimate the additional acreage of juvenile rearing habitat gained from Table 2 flow requirements compared to 2000 Biological Opinion/Alternative 3C flow requirements, State Water Board staff used the average top width of each rearing habitat type at 10 and 20 cfs multiplied by the length of habitat in each of the three river reaches directly below Bradbury Dam. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 4-5.) Top width is not a complete description of habitat, but it provides an index of the amount of habitat available. (*Id.*, p. 2-35.) The primary rearing areas for juvenile steelhead are runs, pools, and glides. (MU-224, p. 3; CT-30, p 5.) Therefore, in each reach, the average distance of top width in feet for runs, pools, and glides at a flow rate of 10 cfs and 20 cfs, respectively, was multiplied by the length of habitat in feet. The March 1999 SYRTAC Report, (MU-226B, p. A-1) provided top width measurement data and the April 1999 Biological Assessment, (FEIR, Vol. III, Appendix C, 1999 Biological Assessment p. 2-20) provided the habitat length measurement data. To convert the calculated habitat into acres, State Water Board staff divided the total amount of habitat in square feet by 43,560

[45] The 48 cfs flow rate requirement in Table 2 was rounded to 50 cfs to calculate increased spawning habitat because it was the closest available flow rate with corresponding top width measurements. (MU-226B, p. A-1.)

square feet per acre.[46] The calculation and estimated increase in steelhead rearing habitat as a result of the increased Table 2 Flows is shown in Table B– Juvenile Steelhead Rearing Habitat Improvements.

Here is an example of the calculations in Table B. At 10 cfs the average top width for runs and pools (juvenile rearing habitat) is 70 and 226 feet, respectively, in the Highway 154 Reach. The length of the run habitat is 468 feet and pool habitat is 12,481 feet. As shown in Table B, multiplying the top width (feet) and length (feet) for each habitat type, adding the results, and dividing by 43,560 square feet per acre equals the total acres of habitat at 10 cfs. The same calculation was performed to determine the amount of rearing habitat at 20 cfs.

To estimate the additional acreage of spawning habitat gains under Table 2 Flows compared to 2000 Biological Opinion/Alternative 3C flow requirements, State Water Board staff multiplied the average top width of each spawning habitat type at 10 and 50 cfs by the length of habitat in each of the three river reaches directly below Bradbury Dam. (FEIR, Vol. III, Appendix C, 1999 Biological Assessment, p. 4-5.) The primary spawning areas for steelhead are riffles and runs. (*Ibid.*) Therefore, in each reach, the top width in feet for riffles and runs at a flow rate of 10 cfs and 50 cfs, respectively, was multiplied by the length of habitat in feet and then converted into acres. The calculation and estimated increase in steelhead spawning habitat is shown in Table C– Steelhead Spawning Habitat Improvements.

[46] One acre = 43,560 square feet.

Table B– Steelhead Juvenile Rearing Habitat Improvements

Highway 154 Reach				
Flow (cfs)	Top width(feet)[47] x length(feet)[48]			Total acres of habitat
	Runs	Pools	Glides	
10	70 x 468	226 x 12481	not sampled	65.5 acres
20	77 x 468	236 x 12481	not sampled	68.4 acres
Estimate of habitat gained by increased flows.	**2.9 acres (4%) habitat**			
Refugio Reach				
Flow (cfs)	Top width(feet) x length(feet)			Total acres of habitat
	Runs	Pools	Glides	
10	30 x 2800	89 x 2937	59 x 1494	10.0 acres
20	33 x 2800	94 x 2937	62 x 1494	10.6 acres
Estimate of habitat gained by increased flows.	**0.6 acres (6%) habitat**			
Alisal Reach				
Flow (cfs)	Top width(feet) x length(feet)			Total acres of habitat
	Runs	Pools	Glides	
10	30 x 4184	37 x 1346	52 x 3859	8.6 acres
20	35 x 4184	49 x 1346	56 x 3859	9.8 acres
Estimate of habitat gained by increased flows.	**1.2 acres (14%) habitat**			

[47] MU-226B, Appendix A, p. A-1 - top width measurements.
[48] FEIR, Vol. III, Appendix C, p. 2-20 – habitat length measurements.

Table C– Steelhead Spawning Habitat Improvements

Highway 154 Reach			
Flow (cfs)	Top width(feet)[49] x length(feet)[50]		Total acres of habitat
	Riffles	Runs	
10	69 x 3088	70 x 468	5.6 acres
50	83 x 3088	81 x 468	6.8 acres
Estimate of habitat gained by increased flows.	**1.2 acres (21%) habitat**		
Refugio Reach			
Flow (cfs)	Top width(feet) x length(feet)		Total acres of habitat
	Riffles	Runs	
10	51 x 1543	30 x 2800	3.7 acres
50	63 x 1543	37 x 2800	4.6 acres
Estimate of habitat gained by increased flows.	**0.9 acres (24%) habitat**		
Alisal Reach			
Flow (cfs)	Top width(feet) x length(feet)		Total acres of habitat
	Riffles	Runs	
10	45 x 4991	30 x 4184	8 acres
50	59 x 4991	35 x 4184	10 acres
Estimate of habitat gained by increased flows.	**2 acres (25%) habitat**		

In addition to the juvenile rearing and spawning habitat increases of Table 2 Flows, flows that more closely resemble natural conditions have also been shown to provide better quality habitat. Populations of steelhead respond to variable hydrologic conditions with a boom-bust cycle, with abundance increasing during and following wet years when migration, spawning, and rearing habitat expands and contracting during dry years when habitat contracts. (FEIR Vol. II, p. 2.0-29.) The steelhead community could be improved by providing more water during the wet, boom cycle which more closely reflects natural flow patterns and creates more favorable conditions for steelhead. (CT-74, pp. 6, 12-13.) Also, as CalTrout opined, the higher flows under Alternative 5C could provide better protection for steelhead by allowing the non-native predatory fish to spread out within the

[49] MU-226B, Appendix A, p. A-1 - top width measurements.
[50] FEIR, Vol. III, Appendix C, p. 2-20 –habitat length measurements.

River and not be concentrated in pools with steelhead. (EDC 09/28/07 RDEIR Comment Letter.)

~~5.3.1.6~~5.3.3.3 *Water Supply Impacts of Alternatives 3C and 5C*

The FEIR includes an analysis of the potential water supply impacts of the various alternatives, including 3C and 5C. (FEIR, Vol. II, pp. 4.3-1 to 4.3-30.) To determine whether the alternatives would have water supply impacts, the FEIR compared the Member Units' projected demand for water to their water supplies from all sources, including the Cachuma Project, the SWP, other surface water sources, groundwater, and recycled water. For purposes of the analysis, Cachuma Project deliveries were estimated based on SYRHM simulations for the period from 1918 to 1993. As explained in the FEIR, the principal value of the modeled output is as a tool for comparison of the alternatives, not forecasting actual drought supplies with complete accuracy. (*Id.*, p. 4.3-14.)

The analysis in the FEIR indicates that none of the alternatives would have an appreciable effect on the Member Units' water supply during wet or normal hydrologic conditions, but some of the alternatives, including Alternative 5C, could exacerbate water supply shortages during critically dry years or periods. (FEIR, Vol. II, pp. 4.3-14 to 4.3-15.) Table 4-17 of the FEIR (Member Units' Supply and Demand During Critical Drought Year (1951)) summarizes potential water supply shortages during a critically dry year, and Table 4-25a (Member Units' Supply and Demand During 3-Year Critical Drought Period (1949-1951) summarizes potential water supply shortages during a critically dry three-year period. (*Id.*, pp. 4.3-18, 4.3-25.) As shown in those tables, the data indicate that the Member Units' water supply shortage during a critically dry year or period would be essentially the same under baseline conditions and 2000 Biological Opinion/Alternative 3C because the increased releases for fishery resources under 2000 Biological Opinion/Alternative 3C are offset by the 3.0-foot surcharge. (*Id.*, pp. 4.3-15, 4.3-18, 4.3-25.) Under both baseline conditions and Alternative 3C, the Member Units' could experience a shortage of approximately 13,000 af in a critically dry year, and approximately 28,500 af in a critically dry three-year period. (*Id.*, pp. 4.3-18, 4.3-25.)

Under Alternative 5C, the Member Units' water supply shortage in a critically dry year under the forecasted 2020/2030 demand period[51] was projected in the FEIR to increase by 1,511 af, or approximately four percent of the total water supply, relative to 2000 Biological Opinion/Alternative 3C. (FEIR, Vol. II, p. 4.3-18.) During a three-year critical drought period, the Member Units' water supply shortage was projected in the FEIR to increase by 3,881 af compared to 2000 Biological Opinion/Alternative 3C, or approximately three percent of the total water supply, under the forecasted 2020/2030 demand period.

One of the key hearing issues was what water conservation measures could be implemented to minimize any water supply impacts of any measures that may be necessary to protect public trust resources. The FEIR includes a general discussion regarding implementation of water conservation measures by the Member Units. (FEIR, Vol. II, pp. 4.3-36 to 4.3-37.) The discussion concludes that even though the Member Units already have implemented conservation measures, it may be possible to implement additional drought contingency measures identified as part of the Member Units' urban water management plans to mitigate for a temporary water supply shortage in a critical drought year or period under Alternative 5C. Although the FEIR identified the potential to mitigate for the water supply impacts of Alternative 5C by implementing drought contingency measures, the FEIR did not quantify the amount of water that could be conserved, or conclude that implementation of drought contingency measures would be adequate to fully compensate for the potential water supply shortages under Alternative 5C.

CalTrout presented testimony and other evidence that the FEIR overestimated water supply impacts and failed to consider feasible conservation measures. Ms. Heather Cooley, Co-Director of the Water Program at the Pacific Institute and an expert witness for CalTrout, testified that the water demand projections used in the FEIR are based on outdated estimates and ignore more recent water demand projections included in the

[51] 2020/2030 water demand means demand within the ten-year period 2020 to 2030. Water demand projections for MWD are for the year 2030; projections for SYRWCD, ID No. 1 are for the year 2025; and projections for GWD, City of Santa Barbara, and CVWD are for the year 2020. (CT-101, p. 3.)

Member Units' 2010 Urban Water Management Plans. (CT-101, p.1.) Ms. Cooley also argued that the demand projections in the FEIR fail to integrate mandated water conservation efficiency improvements, particularly a requirement to reduce per capita demand statewide by 20 percent by 2020. (R.T., March 29, 2012, pp. 83:14-84:24.) Ms. Cooley argued further that the FEIR failed to consider:

1) The Member Units' ability to reduce urban demand by at least 5,000-7,000 af through cost-effective conservation;
2) The availability of alternative supplies, such as rainwater and recycled water; and
3) The potential for reducing agricultural water demand.

(CT-101; R.T., March 29, 2012, pp. 87:14-92:25.)

Ms. Cooley clarified on cross-examination that she had not conducted any studies specific to the Cachuma service area and that she did not have any specific knowledge of agricultural conservation practices or infrastructure in that area. (R.T., March 29, 2012, p. 119:10-119:18.)

Cal-Trout also provided written testimony authored by Dana Haasz and Peter Gleick, of the Pacific Institute, which provided analysis concluding that "the contractors can reduce their take of water from the Santa Ynez River without a loss of service or quality of life." (CT-50, p. 1.) According to the authors of the analysis, "[s]ubstantial water can be freed up for environmental purposes and future expected growth simply by applying existing efficiency technologies and well-understood policies to conserve water, in a cost-effective manner." (*Ibid.*) The analysis concludes that impacts to water supplies caused by alternatives that involve greater releases of water than proposed in the EIR "can also be mitigated." They estimate that "between about 5,000 and 7,000 [afa] of water can be cost-effectively conserved by programs to implement the conservation measures described in this report" and that "demand can be reduced so that the impacts of a critical dry year are considerably less severe." (*Id.*, p. 16.)

To rebut Ms. Cooley's testimony, the Member Units presented testimony and other evidence that the demand projections in the FEIR were accurate. (R.T., March 29, 2012, pp. 128:9 to 129:16, 132:2 to 134:22.) They also testified that the demand projections take into account both plans to implement additional conservation measures to reduce per capita demand and the availability of alternative water supplies. (*Id.*, pp. 129:17 to 131:13, 133:2 to 133:22.) In addition, witnesses for the Member Units testified that per capita use within the Member Units' service areas is already well below the statewide average, and that the Member Units do not have the ability to conserve a significant amount of water by implementing additional urban water conservation measures, or by improving agricultural efficiency. (*Id.*, pp. 124:21 to 126:22, 129:7 to 131:13, 134:10-134:22, 142:8 to 150:6.)

Based on the evidence submitted by the Member Units, the FEIR's analysis of the water supply impacts of the alternatives appears to provide a reasonable upper limit estimate of the potential water supply impacts of the alternatives. In addition, Ms. Cooley's assertion that the Member Units could conserve an additional 5,000-7,000 afa of water is not consistent with the testimony submitted by Member Unit witness, Ms. Kate Rees. (MU-209; MU-238.) Ms. Rees addressed the Member Units' historical implementation of water conservation programs and practices. (MU-209.) According to the written testimony, the Member Units, all of whom are signatories to the California Urban Water Conservation Council's (CUWCC) Memorandum of Understanding Regarding Urban Water Conservation in California have implemented water conservation programs and practices for more than 30 years.[52] (*Id.,* p. 2.)

In 1995, when the Cachuma Project Water Supply Contract was renewed, Reclamation determined that all of the Member Units must implement Water Conservation Plans that meet or exceed federal standards. The City of Santa Barbara and the GWD, who together hold entitlement to approximately 70 percent of the Cachuma Project yield, have the most comprehensive water conservation programs in place among the Cachuma Member Units. (MU-209, pp. 1-2.) All other Member Units actively participate in the Santa Barbara County Water Agency's Regional Water Efficiency Program, which implements several

[52] As signatories to the CUWCC Memorandum of Understanding, each of the Member Units has established a water conservation program to implement the CUWCC best management practices.

water conservation best management practices on a regional level. (*Ibid.*) In conjunction with Reclamation, the Member Units ensure that they continue to meet or exceed all federal standards, including those developed in cooperation with the CUWCC.[53] (*Id.*, p. 3.) The evidence submitted by the Member Units concludes that the Member Units "have achieved a significant level of conservation within their service areas, and they are committed through both voluntary and mandatory requirements to continue this commitment into the future...."[54] (*Id.*, pp.21-22; MU-238.) Moreover, even assuming that Ms. Cooley's testimony was correct, the conclusion that Alternative 5C could exacerbate water supply shortages in critically dry years would not change. Even so, additional water conservation efforts by the Member Units may be necessary to minimize water supply impacts in critically dry years as well as meet existing or future water conservation requirements.[55]

According to Ms. Cooley, the Member Units' projected demand should be reduced by 3,500 to 4,900 af. (CT-101, p. 3.) Based on the FEIR's 2020/2030 demand period projections, Table 4-17 of the FEIR indicates that the Member Units' potential water supply shortage in a critically dry year would be 12,922 af under baseline conditions, and 14,520 af under Alternative 5C. (FEIR, Vol. II, p. 4.3-18.) Even if projected demand for the period 2020/2030 was reduced by 4,900 af, a shortage of 8,022 af would remain under baseline conditions (12,922 - 4,900 = 8,022), and a shortage of 9,620 would remain under Alternative 5C (14,520 – 4,900 = 9,620).[56] Even assuming that demand could be further

[53] The Member Units' demand management measures currently used generally conform to descriptions developed through the CUWCC, and include: Residential Water Surveys; Residential. Plumbing Retrofits; Water Audits and Repair; Meters; Landscape Conservation; Washing Machine Rebates; Public Information; School Education; Conservation for Commercial, Industrial and Institutional Users; Conservation Pricing; Conservation Coordinator; Water Waste Prohibition; and Ultra-Low Flow Toilet Replacement. (MU-209, pp. 8-10.)

[54] The Water Conservation Bill of 2009 (SBX7-7) provides the regulatory framework to support the statewide reduction in urban per capita water use described in the 20 by 2020 Water Conservation Plan. Consistent with SBX7-7, each water supplier must determine and report its existing baseline water consumption and establish future water use targets in gallons per capita per day; reporting is to begin with 2010 Urban Water Management Plans. (CT-101, pp. 3-4.)

[55] Discussion related to achieving '20 by 2020' conservation requirements are discussed in extracted portions of 2010 Urban Water Conservation Plans entered into the record by CalTrout for CVWD, GWD and City of Santa Barbara. (CT-104; CT-105; CT-106.)

[56] Using the worst drought year on record (1951) for purposes of analysis, project yield under baseline operations (Alternative 2) would be 15,906 af, which represents a 38 percent shortage, and under

reduced by conserving an additional 7,000 af, a shortage under baseline conditions and Alternative 5C would remain and may require new sources of water, which could result in significant and unavoidable impacts, but these impacts should be avoided to the extent feasible by implementing conservation measures.

5.3.3.4 Water Supply Impacts of Alternative 3C and 5C with Potential Future Sources of Supply

As discussed in the FEIR, the City of Santa Barbara owns a reverse osmosis desalination plant, the Charles E. Meyer Desalination Facility, which was constructed as an emergency water supply in response to the severe drought lasting from 1986 to 1991. (FEIR, Vol II, pp. 4.3-33 to 4.3-35.) A portion of the reverse osmosis filtration capacity was subsequently sold, leaving a current capacity of 3,125 afa. (See *Id.*, p. 4.3-33.) The plant was later decommissioned after 1991 and has remained in long-term standby mode for reactivation when water demand cannot be met using all other available supplies, including extraordinary water conservation. (FEIR, Vol II, p. 4.3-33.) The City of Santa Barbara has recognized the role of desalination as a vital back-up supply for potential prolonged drought and unforeseen interruption of water supply. (*Ibid.*)

On June 4, 1991, voters elected to make desalination a permanent part of the City of Santa Barbara's water supply portfolio along with surface water from Cachuma and Gibraltar reservoirs, groundwater, State Water Project water, purchased water, recycled water, and conservation. (*Id.*, p. 4.3-8, Table 4-12.) With the approval of the Long Term Water Supply Program on July 5, 1994, the City of Santa Barbara added the desalination facility to its permanent sources of water. (*Id.*, p. 4.3-34.)

The FEIR includes information on water supply impacts to the Member Units in the event that desalination water became available in the future. (FEIR Vol II, p. 4.3-33.) Because the desalination facility was non-operational at the time, the FEIR went on to conservatively evaluate water supply impacts without desalination water as a source for

Alternative 5C would be 14,308 af, which represents 55 percent shortage relative to the desired project yield of 25,714 af. (FEIR, Vol. II, p. 4.3-17.) Assuming for the sake of argument a direct correlation between project yield and project demand, reducing project demand by 4,900 af would still produce significant shortages.

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the Member Units. (See *Id.*, pp. 4.3-25, 4.3-26 (Tables 4-25a, 4-25b), pp. 4.3-18, 4.3-20 (Tables 4-17, 4-18).) This was done, in part, in response to objections received from the Member Units in comments submitted on the RDEIR regarding the potential use of the desalination facilities. (See FEIR, Vol. I, p. 2.0-318 [Response 1-20].) There is no evidence in the record as to when, specifically, the desalination plant would be able to resume operation. State Water Board staff revisited the FEIR analysis to examine the potential, hypothetical effects on water supply impacts if the desalination facility resumed operation in the future.

With an additional 3,125 afa of water during the evaluated critical drought year (1951) and three-year drought period (1949-1951), respectively, the City of Santa Barbara's adjusted water supply from sources other than Cachuma Reservoir would be 8,225 af and 25,807 af. Allowing for this adjustment, the Member Units' water supply from sources other than Cachuma Reservoir during a critical drought year (1951) and three-year drought period (1949-1951), respectively, would be 24,060 af and 73,142 af. The following adjusted FEIR Table 4-17 and Table 4-25a include the change in water supply under Alternative 5C if desalination water were available. Under Alternative 5C, the FEIR predicts that 1,598 afa would not be available to the Member Units during a critically dry year. Having an additional 3,125 afa of desalination water available would eliminate the Member Units' water supply impacts, compared to baseline conditions.

Adjusted Table 4-17 (FEIR p. 4.3-18)
Member Units' Supply and Demand in Critical Drought Year (1951) (afa)

	Alt 2 (Baseline Conditions under WR 89-18 and WR 94-5)	Alt 3C (Existing Operations under Biological Opinion and Settlement Agreement with 3.0' surcharge)	Alt 3C (Biological Opinion and Settlement Agreement) (with desal) Max. capacity = 3,125 afa.	Alt 5C: "3A2"/ Biological Opinion and 3' surcharge	Alt 5C: "3A2"/ Biological Opinion and 3' surcharge (with desal) Max. capacity = 3,125 afa.
1. Cachuma Project yield in a critical drought year (SYRHM simulation. Appendix F, Technical Memorandum No.5)	15,906	15,819	15,819	14,308	14,308
2. Total supply from sources other than the Cachuma Project **(Table 4-18)**	20,935	20,935	24,060	20,935	24,060
3. Total supply **(line 1 + line 2)**	36,841	36,754	39,879	35,243	38,368
4. Year 2010 demand **(Table 4-19)**	45,676	45,676	45,676	45,676	45,676
5. *Surplus(+) or shortage(-)* ***(line 3 – line 4)***	-8,835	-8,922	-5,797	-10,433	-7,308
6. Change from Baseline (Alt.2) *surplus(+) or shortage(-)*	-	-87 (-1%)	+3,038 (34%)	-1,598 (-18%)	+1,527 (+17%)
7. Year 2020/2030 demand **(Table 4-19)**	49,763	49,763	49,763	49,763	49,763
8. Shortage ***(line 3 – line 7)***	-12,922	-13,009	-9,884	-14,520	-11,395
9. Difference from Baseline (Alt.2)	-	-87 (-0.7%)	+3,038 (+24%)	-1,598 (-12%)	+1,527 (+12%)

Table 4-25a (FEIR p. 4.3-25)
Member Units' Supply and Demand
-During Critical Three-Year Drought Period (1949–1951) (afa)

	Alt 2 (Baseline Conditions under WR 89-18 and WR 94-5)	Alt 3C (Existing Operations under Biological Opinion and Settlement Agreement with 3.0' surcharge)	Alt 3C (Biological Opinion and Settlement Agreement) (with desal) Max. capacity = 3,125 afa.	Alt 5C: "3A2"/ Biological Opinion and 3' surcharge	Alt 5C: "3A2"/ Biological Opinion and 3' surcharge (with desal) Max. capacity = 3,125 afa.
1. Cachuma Project yield in a critical drought year (SYRHM simulation, Appendix F, Technical Memorandum No.5)	57,008	57,217	57,217	53,336	53,336
2. Total supply from sources other than the Cachuma Project (**Table 4-25b**)	63,767	63,767	73,142	63,767	73,142
3. Total supply (**line 1 + line 2**)	120,775	120,984	130,359	117,103	126,478
4. Year 2009/2010 demand (**Table 4-19 * 3**)	137,028	137,028	137,028	137,028	137,028
5. *Surplus(+) or shortage(-)* ***(line 3 – line 4)***	-16,253	-16,044	-6,669	-19,925	-10,550
6. Change from Baseline (Alt.2) *surplus(+) or shortage(-)*	-	+209 (+1.3%)	+9,584 (+ 59.0%)	-3,672 (-22.6%)	+5,703 (+35%)
7. Year 2020/2030 demand (**Table 4-19 * 3**)	149,289	149,289	149,289	149,289	149,289
8. Shortage ***(line 3 – line 7)***	-28,514	-28,305	-18,933	-32,186	-22,811
9. Change from Baseline (Alt.2) *surplus(+) or shortage(-)*	-	+209 (+0.73%)	+9,581 (33.6%)	-3,672 (-12.8%)	+5,703 (+35%)

As discussed in the FEIR, concerns regarding water quality and power generation effects would be mitigable to less than significant levels. (See FEIR, Vol II, p. 4.3-35.) Water quality impacts of the discharge from the Charles E. Meyer Desalination Facility into the ocean can be mitigated through compliance with a national pollutant discharge elimination system (NPDES) permit issued by the Regional Water Quality Control Board, Central